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# Student Perceptions of Desired Learning Media Technology Development

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**Abstract**

This study aimed to explore the perceptions of undergraduate students on suitable learning media for website development. A qualitative method with a case study type was used in this research. Fifty undergraduate students from the Educational Technology department participated. A questionnaire was used as the instrument to gather data on the necessary learning media. Data analysis was performed using NVivo 12 software, and results were presented as percentages based on two indicators: technology accessibility and learning materials. The study's results and discussion highlighted two crucial factors influencing the choice of learning media in website development education. First, technology accessibility factors, encompass technological support and interaction. Second, learning material factors, including the type and complexity of the material. These findings offer valuable insights for developing more effective learning media in web development courses by taking these key factors into account.

**Keywords:** Case study; Elementary School; Learning Media; Need Analysis

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## INTRODUCTION

The learning process is a series of activities designed to improve students' understanding, skills, and knowledge (Adipat et al., 2021; Setiawan & Iasha, 2020; Sumardi et al., 2020). This process involves dynamic interactions between teachers and students, the use of effective teaching methods, and the use of adequate educational resources (Alenezi, 2020; Tuma, 2021). Two main factors influence the learning process, namely factors that come from within the individual (individual factors) such as maturity, intelligence, practice, and motivation, and factors that come from outside the individual (social factors) such as family conditions, teacher teaching methods, teaching aids, environment, and available opportunities (Munna & Kalam, 2021; Wahyudi, 2021). These two factors interact with each other and together shape the quality and effectiveness of the learning process.

The use of digital learning media, particularly platforms like Moodle, has become a significant solution in modern education. It offers a wide range of

conveniences in course management, material delivery, and interaction with students, which makes it an invaluable tool in the context of online learning (Bradley, 2021; Setiawan et al., 2020; Simanullang & Rajagukguk, 2020). As a learning management platform (LMS), Moodle provides a range of flexible and structured learning support features (Morze et al., 2021). For example, discussion forums allow students to collaborate and discuss specific topics online, increasing engagement and understanding of the material (Simanullang & Rajagukguk, 2020). Online quizzes allow teachers to conduct live evaluations and provide quick feedback, so students can know their progress more clearly (Fernando, 2020). In addition, real-time tracking of student progress allows teachers to monitor each student's learning development and adjust teaching strategies as needed (Sáiz-Manzanares et al., 2020). All these features support more dynamic and personalized teaching, and give students easier access to learning materials from a variety of devices, be it computers, tablets, or smartphones.

However, the complexity of developing and managing a system like Moodle can be a significant barrier for many teachers. Not all educators have sufficient technical skills to utilize all the features of Moodle effectively (Bojiah, 2022). This often results in difficulties in utilizing the full potential of the platform, which in turn can affect the quality of the learning process. Therefore, it is important to introduce and develop an understanding of the Learning Management System (LMS) as early as the prospective teacher's college years. This introduction will provide the necessary technical skills to properly manage and utilize the system (Bongomin et al., 2020). With this approach, graduates are expected to develop and adapt the LMS platform independently in their work environment. This not only improves teachers' readiness to face the challenges of education technology but also maximizes the potential of using digital media in the learning process, which in turn can improve the overall quality and effectiveness of education.

NVivo 12 is a software that can be used to help analyze qualitative data. It was introduced by QSR International 30 years ago (Allsop et al., 2022; Syarifuddin et al., 2017). This software has been widely used by several researchers, such as Syaodih et al. (2021) “Parent’s perspective on early childhood learning needs during covid-19 using Nvivo 12 software: A case study in Indonesia”, Alam (2021) “A systematic qualitative case study: questions, data collection, NVivo analysis, and saturation”, Riadi et al. (2021) “Challenges Of Islamic Religious Higher Education In Indonesia: Qualitative Analysis Using NVivo Software”. Thus, it is hoped that the NVivo 12 software can provide an overview of the learning media needs of the undergraduate students of the Learning Technology department in developing a Learning Management System (LMS).

## METHODS

### Research Design

This study aimed to explore the perceptions of undergraduate students on suitable learning media for website development. A qualitative method with a case study type was used in this research. The case study type is a research approach used to gain a deep and comprehensive understanding of a phenomenon in the

context of real life (Nguyen Ngoc et al., 2022). Through this approach, the study focused on a specific group of students who were enrolled in a web development course at a university.

**Participant**

This research applies a sampling technique called purposive sampling. Purposive sampling is a method based on specific considerations, as explained by Andrade (Meter & Setiawan, 2023). This study involved 50 students of the educational technology study program consisting of 13 males (code M) and 37 females (code F). With the purposive sampling approach, we ensure the presence of variety and diversity in the group of participants, which will help us analyze the data more comprehensively.

**Instrument**

The instrument used in this research is an online questionnaire distributed via Google Forms. The questionnaire is a data collection technique that is done by giving a set of questions or written statements to respondents to answer []. There are two indicators made to determine the needs of learning media, namely: (1) technology accessibility and (2) learning materials. Technology accessibility was chosen as an indicator due to the importance of student's ability to access devices and networks required for digital learning. Technology accessibility includes aspects such as technology support and interactive support. Meanwhile, learning materials are chosen for their relevance in ensuring that the content delivered is in line with the curriculum and students' needs. Learning materials include content that is learning material type and learning material complexity required in website development. Then from these two indicators, options are provided for undergraduate students to choose from. The sub-indicators for each of these indicators can be seen in Table 1 and Figure 2, which illustrate the specific aspects assessed by students in determining the need for effective learning media.

**Table 1.** Code for each sub-indicator

| No. | Indicator | Sub-Indicator | Code |
|---|---|---|---|
| 1 | Technology Accessibility | Technology Support | TS |
| | | Interactive Support | IS |
| 2 | Learning Material | Learning Material Type | LMT |
| | | Learning Material Complexity | LMC |

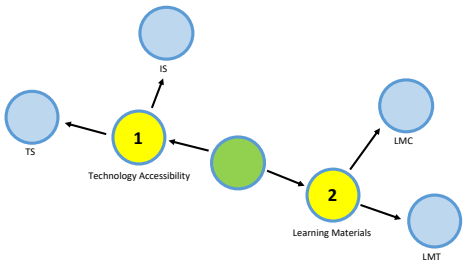


**Figure 1.** Project map of learning media needs

To deepen the results from the questionnaire, interviews were conducted with the online sample. The interview is a data collection technique conducted through

face-to-face and direct questions and answers between researchers and interviewees. This interview is expected to provide deeper insight into the reasons and considerations of students in choosing learning media, as well as add context that cannot be obtained only from the questionnaire.

**Data Analysis**

Data analysis in research is an important step in processing data collected into useful information. The study's final results depend not only on the data collected but are closely related to how the data is analyzed. In this research, the data analysis technique used is descriptive analysis technique through a qualitative approach. Data and information obtained from questionnaires and interviews were then analyzed by referring to relevant theories and presented systematically based on findings in the field. The data analysis and conclusion-drawing process is supported by NVivo 12 software. NVivo has the advantage of connecting coding results, querying data, and compiling analysis maps based on research data.

## RESULTS & DISCUSSION

### Result

***Technology Accessibility***

Technology accessibility refers to the ease of individuals in obtaining and using the technological devices and internet services needed for digital learning. Figure 2 shows the results of the analysis of the learning media needs of undergraduate students for website development learning in the context of technology accessibility.

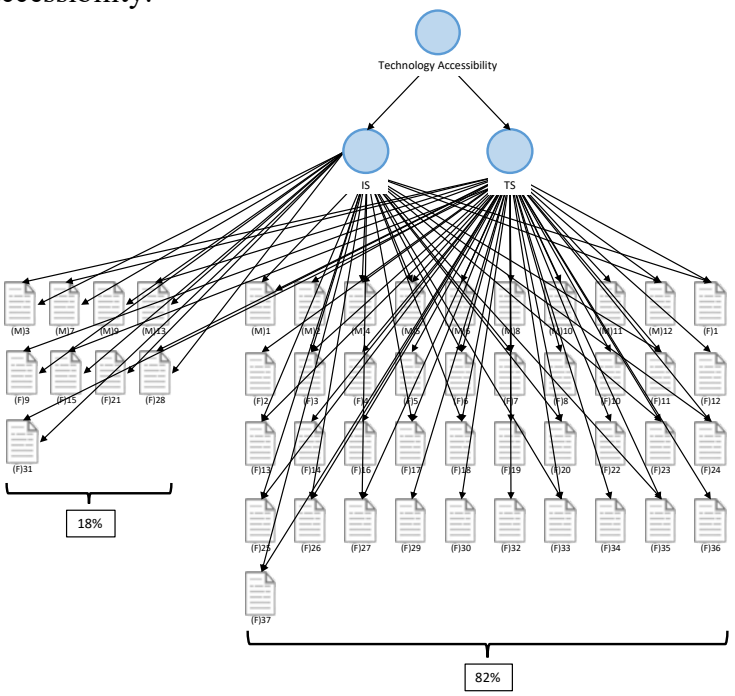


**Figure 2.** Technology Accessibility

The data results show that the majority of students, namely 82%, chose Technology Support as the main point in choosing learning media for website development. This shows that technology accessibility and technical support are very important aspects for them in learning website development. In addition, 18% of students chose Interactive Support as the main point, indicating that interactive features such as discussion forums and live tutorials are also considered important to support their learning process. Interestingly, 76% of all respondents stated that both points, namely Technology Support and Interactive Support, are important factors in choosing learning media. This emphasizes the need for a combination of strong technology support and interactive features to create an effective learning environment and support students' needs in learning website development skills.

To deepen the results of the questionnaire, interviews were conducted with several students.

> *"In the context of digital learning, the availability of technological devices is crucial. They help us to engage in more interactive learning and provide access to diverse resources. In addition, portable devices such as smartphones or tablets allow us to organize our learning time more flexibly."* (M)3

> *"In my opinion, clear and easy-to-understand user guides are also a consideration in media selection. We can utilize learning media more effectively when we have access to good guides. Good guides help overcome technical barriers and allow users to focus on the learning material."* (M5)

> *The device's price is an important consideration in selecting learning media. Advanced technology can enhance the learning experience, but not all have access to expensive devices."* (M)13

> *"The availability of technology devices, such as computers, mobile phones, or tablets, is very important in selecting learning media. In this digital era, technology devices allow us to access various learning videos, interactive learning materials, and opportunities to collaborate with fellow students. The flexibility of media such as smartphones is also important because we want to learn anywhere and anytime. I hope many lessons use smartphones as learning media."* (F)22

> *"The device's price is an important factor in selecting learning media. I think we, as future educators, should consider diversity in the availability of expensive devices. Some of us may not be able to afford expensive computers or tablets. Therefore, in learning design, we should look for more affordable solutions, such as platforms that can be accessed through mobile phones (low-priced smartphones)."* (F) 36

> *"I think the quality of the user guide is also an important point. When the user guide is easy to understand and comprehensive, it makes the*

*learning process smoother. We won't get stuck in annoying technical issues. So, clear guidelines are key in the selection of effective learning media."* (F)37

The interview results show that technology support and interactive support are important points in the selection of digital learning media. Many students emphasized the importance of the availability of technological devices such as computers, mobile phones, or tablets to access various learning resources and interactive materials. Portable devices, such as smartphones or tablets, allow students to manage their study time more flexibly and study anywhere and anytime. In addition, the price of the device is also a significant consideration, as not all students have access to expensive devices. Therefore, more affordable solutions, such as platforms that can be accessed via low-priced smartphones, are desirable.

Students also highlighted the importance of clear and easy-to-understand user guides in the use of learning media. good guides help to overcome technical barriers and allow users to focus on the learning material without being distracted by technical issues. With comprehensive and easy-to-understand guides, the learning process becomes smoother and more efficient.

***Learning Material***

Teaching materials play a role in determining the selection of media for the learning process. The results of the questionnaire analysis revealed two main factors that influence students' decisions in choosing learning media. First, the relevant factor is the "aspect of the type of teaching materials", namely the type of material taught. Figure 3 shows the results of the analysis of the learning media needs of undergraduate students for website development learning in the context of learning materials

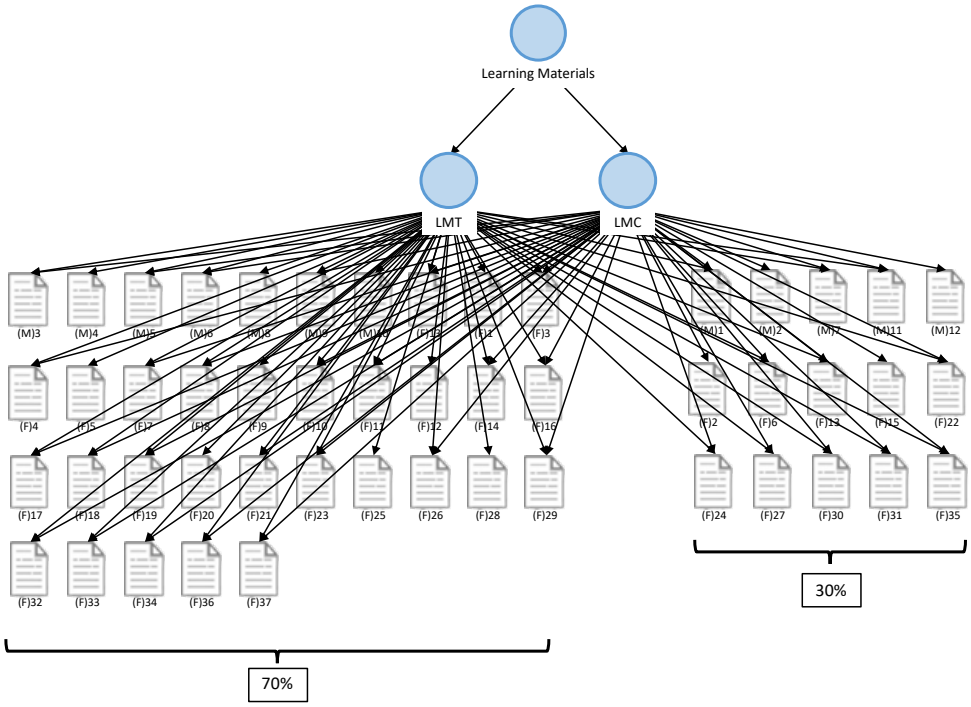


**Figure 3.** Learning material

The data results show that 70% of students choose Learning Material Type as the main point in selecting learning media for website development, indicating that the type of learning material, such as text, video, or interactive module, greatly influences their preference. A total of 30% of students chose Learning Material Complexity as the main point, indicating that the level of difficulty and depth of the material are also important factors considered by students. In addition, 72% of students consider both points, i.e. type and complexity of learning materials, as important factors in choosing learning media.

To deepen the results of the questionnaire, interviews were conducted with several students.

> *"In my opinion, the type of learning material is a factor in selecting learning media. Whether the material is conceptual, practical, or technical, more visual and interactive media may be more suitable for complex conceptual material. In contrast, media that supports hands-on learning can be more effective for practical material. Meanwhile, for technical materials, we tend to look for media that provide tutorials, step-by-step instructions, and in-depth demonstrations."* (M)3

> *"I think one factor is the learning material to be taught. If the material is more conceptual, we might choose media that can provide a clear picture. On the other hand, if the material is more practical, we look for media that supports hands-on learning. For technical material, we need media that provides detailed technical guidance."* (M)5

> *"I see that the type of learning material is also a factor in selecting learning media. This is because each type of material requires a different approach. For example, more conceptual material may require animation or stronger visualization, while practical material may require simulation or practical demonstration. For technical material, we look for media that provides clear technical guidance. So, media selection should match the type of material to maximize learning effectiveness."* (F)22

> *"In my opinion, the complexity of the learning material also influences the decision on the selection of learning media. When learning materials are more complex, we look for media that provide detailed explanations, in-depth examples, and strong visualizations. Media that support problem-based learning or simulations can also effectively tackle difficult-to-understand material.* (M)15

> *"I see that the complexity of the learning material also affects the selection of learning media. For simpler material, maybe a simple media such as a short video is enough. However, when the material is complex, we look for media that can break it down and explain it in detail. Multimedia skills like strong visualization or simulations can help students understand difficult material. So, the selection of media should*

*be aligned with the level of complexity of the material to be taught."* (F)37

The interview results show that the type and complexity of learning materials are important factors in the selection of learning media. Students think that visual and interactive media are more suitable for complex conceptual materials, while media that support practical learning are more effective for practical materials. For technical materials, they tend to look for media that provide tutorials, step-by-step instructions, and in-depth demonstrations. In addition, the level of complexity of the material also influences the decision in media selection. For more complex materials, media that provide detailed explanations, in-depth examples, and strong visualizations are needed. Media that support problem-based learning or simulations are also considered effective for handling difficult-to-understand materials. Meanwhile, for simpler materials, simpler media such as short videos may suffice.

## Discussion

Technological developments strongly influence media selection in the learning process. Technology is an important indicator that determines how we access, present, and process information in the context of education (Azis & Kusnafizal, 2024). Previously, learning media were limited to textbooks, and blackboards (Lau et al., 2018). However, with the advancement of technology, we now have many choices of digital learning media, such as videos (Suryani & Drajati, 2021), interactive simulations (Daryanes et al., 2023), augmented reality (Ramadhan et al., 2022), virtual reality (Sukmawati et al., 2023), and online platforms (Bradley, 2021). The results of the questionnaire analysis revealed that two important factors influence students' decisions in choosing digital learning media, namely, technological accessibility and learning materials.

### *Technology Accessibility*

#### 1. Technology Support

First, the availability of technological devices, such as computers, mobile phones, or tablets, is very important in selecting learning media. Students, in general, are more likely to be interested in digital learning media when they have adequate access to these devices. In this context, smartphones in the form of cell phones and tablets have a significant role. Nowadays, smartphones are not only a communication tool but also a multifunctional device that allows access to various learning resources (Toma & Turcu, 2022). The presence of flexible smartphones in their use anywhere and anytime has become a determining factor in selecting digital learning media. Smartphones, with facilities almost equivalent to computers, allow students to access learning materials easily and efficiently, even when out of the room or on the go (Setiawan et al., 2022).

In the interviews, students emphasized that the availability of devices, especially smartphones, greatly influenced their interest in using digital learning media. They revealed that smartphones allow them to study in convenient places, such as libraries, cafes, or public transportation (Ahmed et al., 2020). In this digital

era, smartphones have become an irreplaceable divais in supporting more flexible learning and can be accessed anytime, according to their schedules. This is in line with research conducted by Uzma Noor et al. (2022), Yu-Sheng Su et al. (2022), and S. Phoong et al. (2019), which states that smartphones are in great demand by students as learning media and have a positive impact on the learning process.

Secondly, the role of device price in implementing technology in learning is an aspect that cannot be ignored. Device price is one factor that significantly affects the success of technology implementation in education. In the digital era, technology is at the core of the learning process, and students around the world are expected to be able to access various technological devices that support their learning.

In reality, students come from different walks of life with varying economic levels. Some students may easily afford the necessary devices, while others may face financial difficulties (Xiao et al., 2020). Especially when the price of the required devices is too high, this can be a severe barrier to students who want to access digital education. These financial difficulties can create a gap in educational accessibility, where students with more limited resources have fewer opportunities to utilize technology in learning.

**2. Interactive Support**

Two important aspects supporting this technology interaction are "user-friendliness," which refers to ease of use, and "learning accessibility," which means accessibility in the learning process. First, user-friendliness is one of the key aspects of choosing the suitable learning media. The success of learning media often depends on how user-friendly it is. Nowadays, students seek media that provide an intuitive and smooth learning experience. This becomes even more important in practical learning contexts, such as website development, where hands-on and practical learning is necessary. Students want to be able to focus on the content and skills they need to master without being distracted by difficulties in using the learning media. Therefore, learning media that provide operational ease will be a top choice for students, allowing them to utilize their learning time efficiently and productively.

students. These students are well aware that learning accessibility is closely related to the ability of learning media to be accessible to all individuals, including those with different conditions. One crucial aspect of learning accessibility is the availability of offline content. Students understand that not all students have stable or, in some cases, any internet access (Noori, 2021). Therefore, learning media that can be accessed offline, such as downloadable materials, videos that can be played without an internet connection, e-books available in offline formats, or augmented reality accessible without the internet, becomes very important. This ensures that students can access and utilize learning materials without technical barriers.

Additionally, technical support is also a focal point for students' attention. Students recognize that clear and easy-to-understand user manuals are key to ensuring that students and teachers can effectively utilize learning media. This may include detailed step-by-step guides, informative video tutorials, or even direct access to the technical support team when needed. Students realize that having these resources can help overcome technical obstacles that may arise during the learning

process (Dwijayani, 2019). Lastly, accessibility for individuals with disabilities is an aspect that students highly emphasize. They understand the importance of ensuring that learning media are designed to consider students' particular needs, including those with disabilities (Reyes et al., 2022). This includes providing alternative text for deaf students, large displays for visually impaired students, and easy-to-use navigation for those with physical limitations. The Educational Technology program students acknowledge that integrating accessibility into learning media design is crucial for a more inclusive and equitable education.

By considering these aspects, students of the Educational Technology Study Program try to ensure that the learning media they choose can deliver learning materials effectively and inclusively and can be accessed by all students, regardless of their conditions or limitations.

### *Learning Material*

#### 1. Learning material type

The selection of learning media is a crucial stage in effective educational design, and one of the primary factors influencing decisions about media selection is the type of learning material. Various types of learning materials can be categorized into three main groups: conceptual, practical, and technical (Altmeyer et al., 2020).

The first type of learning material is conceptual material, which deals with abstract concepts and ideas. It often involves understanding scientific concepts, theories, or principles that require critical thinking and in-depth comprehension (Cáceres et al., 2020). In conceptual learning, the choice of learning media type becomes pivotal. Effective learning media for conceptual material must be capable of visualizing abstract concepts and theories, enabling students to understand and retain them easily. One commonly used form of media is graphic visualization, encompassing images, charts, diagrams, and illustrations. These visuals can aid in presenting abstract concepts in a manner that is more accessible for students to grasp and remember. For instance, visual-based learning media like comics, as reported by Mustika Sari et al. (2020), Nofha Rina et al. (2020), and Emira Derbel (2019), can be employed in conceptual learning materials.

Furthermore, using simulations and animations can also be a robust choice. Simulations allow students to "observe" how concepts function in real-life scenarios, while animations can illustrate changes or processes clearly and engagingly (Shiu et al., 2020). Research on the use of animation for conceptual learning has also been documented by Rahayu et al. (2021), Stadlinger et al. (2021), and Corral et al. (2021).

Secondly, the practical learning material is more related to understanding and applying concepts in practical or daily life situations (Van Ryneveld et al., 2020). This may include learning practical skills such as operating equipment or everyday tasks. In these situations, effective learning media should be able to present information in a way that allows students to observe and apply concepts in actual cases. One suitable media type is a demonstration video that shows the steps of performing a task or skill (Hoogerheide et al., 2019). Step-by-step guides can also be used to outline practical processes clearly.

In some cases, practical projects that involve students in actual tasks can reinforce practical understanding. So, for this type of practical learning, choosing learning media that supports understanding and applying skills in everyday life is important. Also reported by Shiu et al. (2020), Jung et al. (2019), and El-Ariss et al. (2021) on the utilization of video in practical learning.

Finally, technical learning materials are concerned with understanding concepts of a technical nature, such as computer programming, hardware operation, or software understanding. Effective learning media in this context should be able to clearly illustrate technical concepts and provide interactivity that allows students to engage in technical problem-solving. One type of media often used is simulation, enabling students to "see" and test technical concepts in situations close to the real thing (Chernikova et al., 2020). Animation can also effectively explain changes or processes clearly and compellingly (Shiu et al., 2020). In addition, interactive tutorials and technical task-based projects can also assist students in understanding and developing their technical skills (Shareef & Farivarsadri, 2020).

**2. Learning Material Complexity**

A factor that influences the selection of learning media, especially in a learning context, is the complexity of the learning material. Learning Material Complexity is an important parameter that educators must consider when designing learning experiences. Learning material complexity refers to the difficulty and complexity of the material taught to students (Wood & Shirazi, 2020). Complex material may include more in-depth information, abstract concepts, or intricate details that require deep understanding.

In the selection of learning media, the complexity of the learning material becomes a determining factor because the media suitable for complex material may not be the same as those suitable for simpler material. When the learning material is very complex, educators must choose media that can present the material clearly and facilitate understanding (Doyle, 2023). Interactive media, such as simulations or animations, can help students better understand complex concepts, while simpler material may require a more direct approach, such as visual presentations or narrative stories (Manunure et al., 2020).

Understanding the complexity of the learning material also affects how it is presented. For example, in very complex material, educators may need to break it down into smaller parts and use it in tiered learning (Rogowsky et al., 2020; Slanda & Little, 2022). This can help students not feel too pressured by the material's complexity and can gradually increase their understanding.

## CONCLUSION

Research on the needs analysis of digital-based learning media has been successfully conducted. The research data results reveal two main factors that play a role in decision-making related to learning media selection in the website development learning process. First, technological factors become one of the factors in the selection of learning media. This includes technology availability, device price, learning accessibility, and user-friendliness. The second factor found

is the learning material factor. In this context, the type of material taught and its level of complexity play an important role in selecting appropriate learning media. The learning media should be able to accommodate the unique needs and characteristics of the learning materials taught. Therefore, the selection of effective learning media will carefully consider the type of material to be delivered and the level of complexity of the material.

The findings of this study have significant implications for developing more effective learning media in the context of website development. By considering these key factors, learning media developers can better direct their efforts to design learning tools that better suit learners' needs. Therefore, the results of this study provide valuable insights that can guide the development of more effective learning technologies and learning strategies, focusing on improving interaction, technology support, and adaptation of learning media according to the type and complexity of learning materials taught in the context of website development.

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